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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/699,466	10/31/2000	Shunpei Yamazaki	0756-2222	8851

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EXAMINER

SARKAR, ASOK K

ART UNIT	PAPER NUMBER
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2829

DATE MAILED: 08/06/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/699,466

Applicant(s)

YAMAZAKI ET AL.

Examiner

Asok K. Sarkar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 October 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 08/784,290.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 17, 2002 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1 – 13, 15 – 17, 19 and 26 – 34 are rejected under 35 U.S.C. 102(e) as being anticipated by Suzawa, US 5,728,259.

Regarding claims 1, 4, 7, 11, 15, 26, 27 and 28, Suzawa teaches a method of

making a thin film transistor semiconductor device comprising the steps of:

- forming a semiconductor film on an insulating surface with reference to Fig. 2 in column 5, line 45;
- providing crystallization promoting material onto the semiconductor film in column 4, lines 65 – 67;
- crystallizing the semiconductor film by a first heating in column 4, lines 63 – 65;
- forming a semiconductor island having a tapered shape by patterning the semiconductor film having the tapered shape with an angle in the range of 20° to 50° between the side and the underlying surface as shown in Fig. 2A in column 6, lines 6 – 9;
- forming a silicon oxide film on the surface of the semiconductor island by a second heating with reference to Fig. 2C in column 6, lines 20 – 22;
- wherein irradiation of laser light is performed after forming the semiconductor film in column 5, lines 53 – 55.

Regarding claim 2, Suzawa teaches the semiconductor film is a crystalline semiconductor film as described above in rejecting claim 1.

4. Regarding claims 3, 6, 9, 13, 17, 29, 30 and 31, Suzawa teaches patterning by an isotropic dry etching method in between column 5, line 61 and column 6, line 13.

Regarding claims 5, 8, 12 and 16, Suzawa teaches heating at a temperature of 550 – 600°C in column 4, line 63.

Regarding claims 10 and 19, Suzawa teaches crystallization promoting material of Fe, Co and Ni in column 4, line 67.

Regarding claims 32 – 34, Suzawa teaches forming gate electrode in column 8, line 61.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 14, 18 and 20 – 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzawa, US 5,728,259 in view of Funai, US 5,550,070.

Regarding claim 20, Suzawa teaches most of the limitations as described above in rejecting claims 1, 4, 7, 11, 15, 26, 27 and 28 but fails to expressly teach reducing crystallization promoting material by a second heating.

Funai teaches reducing the crystallization promoting material by second heating in column 5, lines 10 - 20 in order to produce a semiconductor film of high performance with excellent reliability and stability.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Suzawa's invention by introducing the step of reducing the crystallization promoting material by second heating taught by Funai so that a semiconductor film of high performance with excellent reliability and stability is produced for the device.

Regarding claims 21, 22 and 25, Suzawa teaches all these limitations as was described above in rejecting claims 3, 5 and 10.

Regarding claims 14, 18 and 23, Suzawa fails to expressly teach second heating temperature higher than first heating.

Funai teaches forming a silicon oxide film on the surface of the semiconductor film by a second heating at a higher temperature than the second heating in column 9, lines 16 – 25 with respect to Fig. 7 and

The oxidation temperature of 650°C is higher than the crystallization temperature of 550 – 580°C in column 8, line 42 in order to accelerate the crystallization of the crystalline semiconductor film (see abstract).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Suzawa's invention to use higher temperature for second heating as taught by Funai since higher temperature would favor accelerated crystallization of the crystalline semiconductor film.

7. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzawa, US 5,728,259 in view of Funai, US 5,550,070 as applied to claim 22 above, and further in view of Gandhi, VLSI Fabrication Principles, John Wiley and Sons, p. 388, 1983.

Suzawa in view of Funai does not expressly teach second heating performed in an atmosphere containing halogen gas.

Gandhi teaches that addition of halogenic species during dry oxidation improves electronic properties of the oxide in the chapter of thermal oxidation of silicon in page 388, paragraph 7.1.6.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to manufacture the semiconductor device by heating the

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semiconductor in an atmosphere containing halogen gas to improve the electronic properties of the oxide.

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. Claims 1, 2, 4, 7, 11, 15, 20 and 26 - 28 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 5 and 6 of U.S. Patent No. 6,180,439 B1. All limitations of these claims such as forming semiconductor film with crystallization promoting materials, crystallizing the film by first heating, patterning the film to an island/mesa shape, laser irradiating the semiconductor film, reducing crystallization promoting materials by forming a silicon oxide by a second heating are disclosed by claims 1, 5 and 6 of U.S. Patent No. 6,180,439 B1.

10. Claims 14, 18 and 23 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 5 of U.S. Patent No. 6,180,439 B1. Claim 5 discloses that the second heating is performed at a higher temperature than the first heating.

11. Claims 10, 19 and 25 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 24 of U.S. Patent No. 6,180,439 B1. Claim 24 discloses the crystallization promoting materials of the instant claims.

12. Claim 24 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 25 of U.S. Patent No. 6,180,439 B1. Claim 25 discloses that the second heating is performed in an oxidizing atmosphere of halogen gas.

13. Claims 3, 6, 9, 13, 17, 22 and 29 – 31 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 4 and 5 of U.S. Patent No. 6,180,439 B1 in view of Boyan, US 4,466,073.

U.S. Patent No. 6,180,439 B1 fails to disclose patterning by isotropic dry etching method.

But, as explained earlier, Boyan teaches a method of dry isotropic etching in column 1, lines 11 – 20 in order to minimize absolute alignment accuracy.

Therefore, given the substantial teaching of claims 4 and 5 of U.S. Patent No. 6,180,439 B1 in view of Boyan, it would have been obvious to one with ordinary skill in the art at the time of the invention to manufacture the semiconductor device with semiconductor islands having a tapered shape by isotropic dry etching.

14. Claims 5, 8, 12, 16 and 21 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 4 and 5 of U.S. Patent No. 6,180,439 B1 in view of Funai, US 5,550,070.

U.S. Patent No. 6,180,439 B1 fails to disclose heating at a temperature of 550 to 750°C.

Funai teaches a method of crystallizing the semiconductor film by heating at a temperature of 550°C in column 6, line 39 to 650°C or higher in column 2, line 56.

Therefore, given the substantial teaching of claims 4 and 5 of U.S. Patent No. 6,180,439 B1 in view of Funai, it would have been obvious to one with ordinary skill in the art at the time of the invention to manufacture the semiconductor device with semiconductor islands by heating at a temperature of 550 to 750°C to crystallize the semiconductor.

15. Claims 32 - 34 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 4 and 5 of U.S. Patent No. 6,180,439 B1 in view of Funai.

U.S. Patent No. 6,180,439 B1 fails to disclose forming a gate electrode on the insulating film.

Funai teaches a method of forming a gate electrode 114 on the insulating film 113 with respect to Fig. 10 in column 9, lines 45 - 46.

Therefore, given the substantial teaching of claims 4 and 5 of U.S. Patent No. 6,180,439 B1 in view of Funai, it would have been obvious to one with ordinary skill in the art at the time of the invention to manufacture the semiconductor device, where a gate electrode is formed on the insulating film.

Response to Arguments

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16. Applicant's arguments with respect to claims 1 - 34 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 703 238 2521. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael J. Sherry can be reached on 703 308 1680. The fax phone numbers for the organization where this application or proceeding is assigned are 703 308 7722 for regular communications and 703 308 7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 4918.

Asok K. Sarkar
August 1, 2002



MICHAEL SHERRY
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